IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Shvarts	**GROUP:**	2634
SERIAL NO:	09/325,099	**EXAMINER:**	Kim, Kevin.
FILED:	06/03/1999		
FOR:	TRANSLATION LOOP MODULATOR		

Assistant Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

SECOND DECLARATION OF JONATHAN STRANGE UNDER 37 C.F.R.§1.132

I Jonathan Strange, hereby declare and state as follows.

1. I am currently employed by Analog Devices, Inc. as an Integrated Circuit (IC) Design Manager.

2. I have been employed by Analog Devices, Inc. for more than 10 years and have been an IC Design Engineer for the past 21 years.

3. I have an MSc degree in Electrical Engineering (1985) from the University of Edinburgh (Scotland, UK) and a BSc degree in Physics from Durham University (England, UK).

4. I am familiar with the above referenced patent application, the cited prior art, and

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the office actions mailed July 11, 2006 and December 7, 2006 in connection with the above referenced patent application.

5. The present application is directed to a dual band radio frequency transmitter system that may operate, for example, either of two modes of operation.

6. Although the circuit of the invention provides dual band operation using a specific frequency (i.e., $F_{LO} = F_{OUT} / (1 + m/n)$ in a first mode of operation and $F_{LO} = F_{OUT} / (1 - m/n)$), techniques for switching between frequency modes of operation had been know prior to the present invention. By 1999, many techniques existed for switching between modes, including the use of PIN diodes, and MESFET transistors. The connection paths would be hard wired, and the appropriate signal would be chosen by the monolithic device.

7. Those skilled in the art in early 1999 would have known that any of the then conventional techniques for providing mode switching could have been employed to achieve the switching between operating modes to provide that $F_{LO} = F_{OUT} / (1 + m/n)$ in a first mode of operation and $F_{LO} = F_{OUT} / (1 - m/n)$ in a second mode of operation, where F_{LO} is the output frequency of the local oscillator, F_{OUT} is the output frequency of the circuit, and *m* and *n* are the values of frequency dividers 84 and 82 shown in Figure 3.

8. In particular, the specification states the following on page 6, lines 8 – 19 (**emphasis added**):

> The circuit provides that the frequency of the transmitter output signal (RF_{OUT}) may be related to the frequency of the local oscillator. **In particular, we are concerned with the high side and low side products of the mixer, and because it's a**

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downconverter, we are concerned with the difference product IF = |RF – LO|. For GSM, therefore, $RF_{LO} / n = (RF_{LO} - RF_{OUT}) / m$, where $RF_{LO} - RF_{OUT}$ is the high side difference product. Solving for RF_{OUT}, $RF_{OUT} = RF_{LO} (1 - m/n)$ which provides that $RF_{LO} = RF_{OUT} / (1 - m/n)$. For DCS, $RF_{LO} / n = (RF_{OUT} - RF_{LO}) / m$, where $RF_{OUT} - RF_{LO}$ is the low side difference product. Solving for RF_{OUT}, $RF_{OUT} = RF_{LO} (1 + m/n)$ or $RF_{LO} = RF_{OUT} / (1 + m/n)$. The values of m and n may be chosen such that the transmitter output signal may be at 900 MHz for GSM, and may be at 1800 MHz for DCS. This may be achieved by recognizing that $RF_{OUT} = RF_{LO} + RF_{IF}$ for DCS and $RF_{OUT} = RF_{LO} - RF_{IF}$ for GSM where RF_{IF} is the frequency of the intermediate frequency signal, which is the feedback signal to the quadrature modulator.

9. This means that for GSM mode, $F_{LO} > F_{OUT}$ and the mixer operates with high side injection since the LO frequency is higher than the input frequency. In this case, the output frequency of the mixer is $F_{LO} - F_{OUT}$, and as stated, it follows that the phase clocked loop (feedback) will ensure that the loop operates such that $(F_{LO} - F_{OUT}) / m = F_{LO}/n$, and therefore, $F_{LO} = F_{OUT} / (1 + m/n)$.

10. This also means that for DCS, $F_{LO} < F_{OUT}$ and the mixer operates with low side injection since the LO frequency is lower than the input frequency. In this case, the output frequency of the mixer is $F_{OUT} - F_{LO}$, and as stated, it follows that the phase locked loop will ensure that the loop operates such that $(F_{OUT} - F_{LO}) / m = F_{LO} / n$, and therefore, $F_{LO} = F_{OUT} / (1 + m/n)$.

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11. An example of the high and low side injection is described with reference to an example on page 7, lines 7 – 15 (**emphasis added**):

> The output signal is also coupled to the downconverter mixer 52 as the R input. The local oscillator input signal will be at a frequency of 1350 MHz. **Since a mixer will produce signals having frequencies at the sum as well as at the difference between the frequencies of the two input signals, the output of the mixer 52 produces two signals, one having a frequency of 2250 MHz, and another having a frequency of 450 MHz. For example, the product of two sine functions sin(α) x sin(β) equals ½ cos(α-β) – ½ cos(α+β). The two frequencies produced at the output therefore would**

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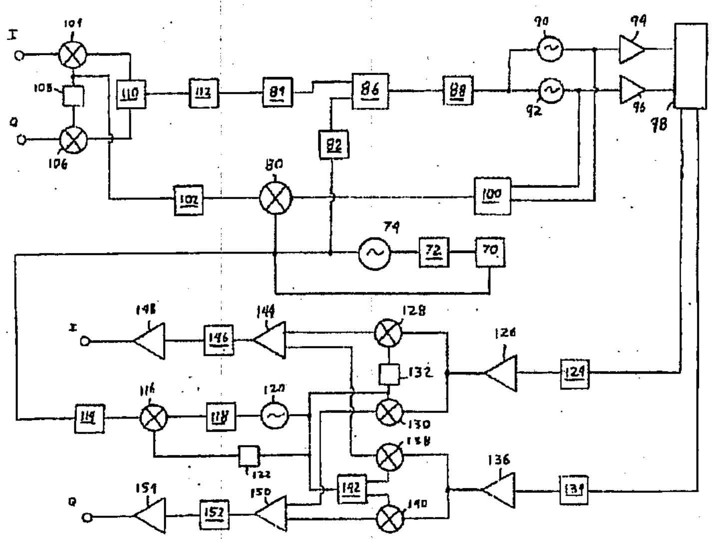
be F_1+F_2 and $F_1 - F_2$. The 2250 MHz signal is filtered out at the filter 54, and the quadrature modulator circuit receives a feedback signal at 450 MHz.

12. With regard to the embodiment shown in Figure 3, the specification further states the following on page 9, lines 7 – 12 (**emphasis added**):

> The output of the filter path includes a matching or **switching device** that alternately receives input signals from the output of one or the other of the VCOs 90 or 92. The output of the **device 100** is presented as in {sic} input to the downcoverter mixer 80.

13. Figure 3 of the specification discloses the following circuit:



14. Given this disclosure, those skilled in the art in early 1999 would have known that any of the then conventional techniques for providing mode switching could have been employed to achieve the switching between operating modes to provide that $F_{LO} = F_{OUT} / (1 +$

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m/*n*) in a first mode of operation and $F_{LO} = F_{OUT} / (1 - m/n)$ in a second mode of operation. The alternative relationships are clearly disclosed since we are switching between two VCOs: one where $F_{LO} > F_{OUT}$ and one where $F_{OUT} > F_{LO}$. The relationships are derived by equating the frequencies at the phase frequency detector.

Signed under penalties of perjury.

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Date: 27 February, 2007

Jonathan Strange

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